PRELIMINARY AND SHORT REPORT

HORMONE AND ENZYME MECHANISMS IN SEBACEOUS GLAND EXCRETION*

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The increased sebaceous gland excretion during puberty, Cushing's syndrome and other conditions associated with increased androgenic or luteinizing steroids has long been recognized. Recent histochemical data suggest an hypothesis for dermatological study of the relationship of certain enzymes with steroids and sebaceous gland excretion.

Briefly, it is proposed that androgenic and estrogenic steroids act on the enzyme systems that yield the reduced triphosphopyridine nucleotide (TPNH) which is required for the hydrogenation and synthesis of lipids.

TABLE I

TPNH production of 0.5 to 5 microgram samples

	ICDH (7)	6 PGDH (8)	Aldolase (8)
Sebaceous glands.....	2840 ± 630	750 ± 70	223
Sweat glands...	1860 ± 130	330 ± 56	302
Epidermis.....	1250 ± 170	280 ± 20	340
Hair follicles...	870 ± 60		
Dermis.....	80 ± 20		90

Each number is the mean activity mM/Kg dry wt/hr with the standard error of the mean. 3 to 6 samples were averaged for each structure. Column 1 is data from a male (7), columns 2 and 3 are data from another male (8).

The data presented in Table I are from the author's laboratory and demonstrate that sebaceous glands have a higher activity of two TPNH yielding enzymes than hair follicles, eccrine sweat glands or epidermis. The enzyme aldolase, and lactic dehydrogenase from the glycolytic cycle shows no such difference in its distribution. Malic dehydrogenase has similar activity in sebaceous and sweat glands (8). More data is needed but the differences are striking.

The reactions are

$$\text{Isocitric Acid} + \text{TPN} \xrightleftharpoons[\text{Mn++}]{\text{ICDH}} \alpha \text{ Keto glutaric acid} + \text{TPNH} + CO_2$$

$$\text{6 phosphogluconic acid and TPN} \xrightleftharpoons[\text{Mn++}]{\text{6 PGDH}} \text{ribulose 5-PO}_4 + \text{TPNH} + CO_2$$

The TPNH which is a product of these reactions appears to be essential for the synthesis of fatty acids (2, 3). Free and esterified fatty acids are 60–75% of human hair fat and are probably the most important constituent of sebum (1).

Most of the dehydrogenase reactions of the body however, generate DPNH not TPNH. An enzyme however has been found which will transfer the hydrogen between the 2 pyridine nucleotides.

$$\text{DPNH} + \text{TPN} \xrightleftharpoons{\text{transhydrogenase}} \text{TPNH} + \text{DPN}$$

In placenta (4, 5) and in breast (6) this reaction is catalyzed by certain estrogenic steroids. Of course much more basic information is needed about these reactions, particularly other factors which may control their direction and rate. A further search for transhydrogenase enzymes in skin, particularly in sebaceous glands and a comparison of the normal glands hyperplastic and hypersecreting glands may be very interesting.

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